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(56) Documents Cited
GB 1483622 A
EP 1127989 A2
EP 1074871 A2
GB 1068761 A
EP 1124023 A2
WO 1997/023694 A1

(58) Field of Search
UK CL (Edition V) E1D DCA DCB DF116
INT CL$^7$ E04B 2/74, E04C 3/07
Other: ONLINE DATABASES: WPI, EPODOC, JAPIO

(54) Abstract Title
**Metal profile for a sound insulation partition wall**

(57) A metal profile for use as a support member in a partition wall comprises an elongate kinked section between its outer flanges. The kink increases the flexibility of the support member and thus reduces the noise transmission. The height of the kink (5, Fig 4) is at least 3mm and is at least twice the length of the base (4, Fig 4) of the kink. To increase flexibility further, apertures 6 may be provided along the kink and a number of kinks 8,9 may be provided. An internal or external wall is formed by fixing boards, such as plasterboards, to the support members.

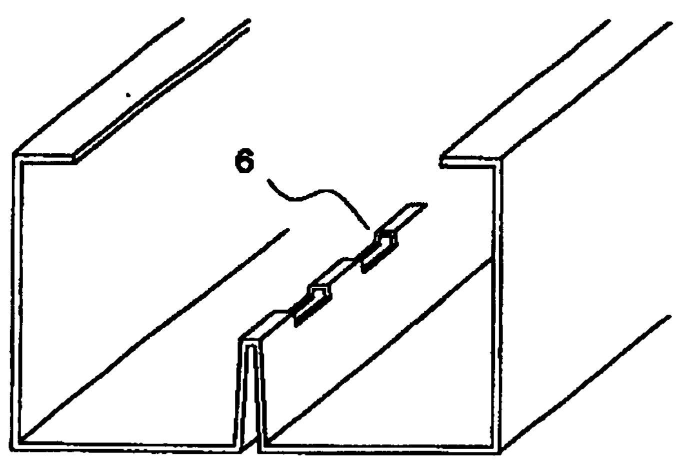


FIGURE SIX

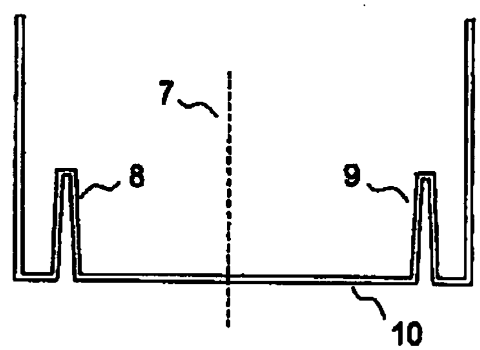


FIGURE SEVEN

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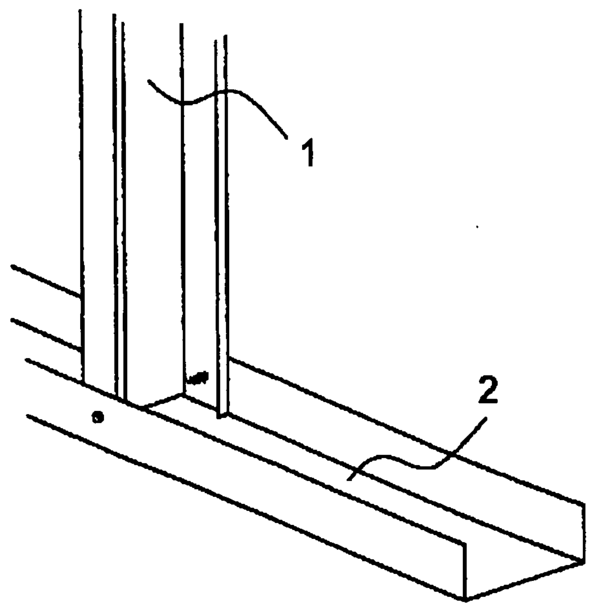


FIGURE ONE

FIGURE TWO

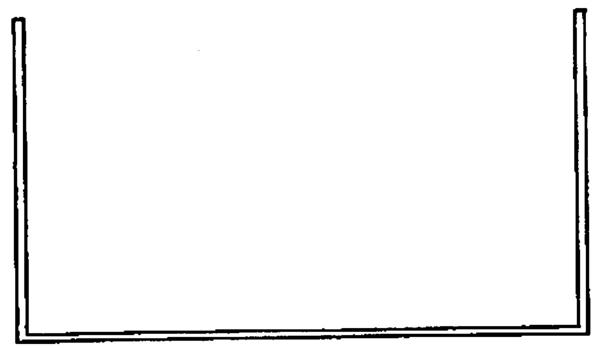

FIGURE THREE

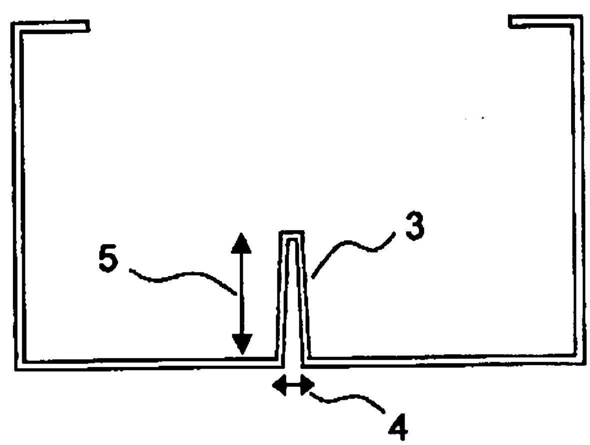


FIGURE FOUR

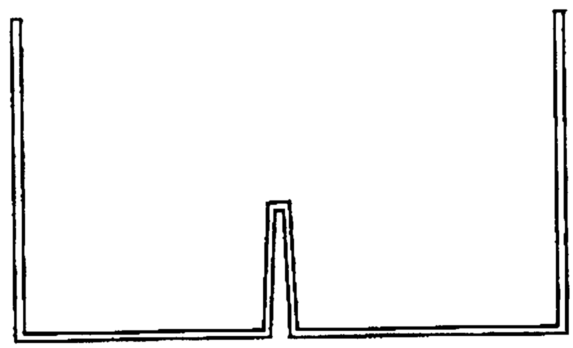

FIGURE FIVE

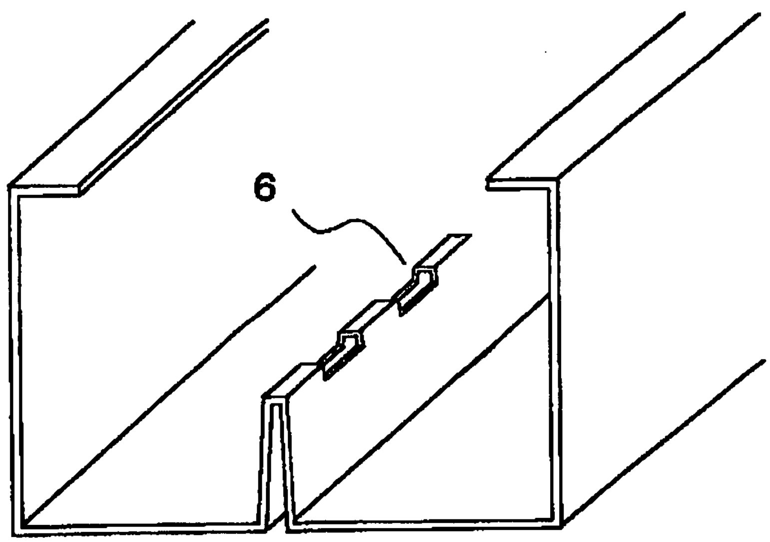


FIGURE SIX

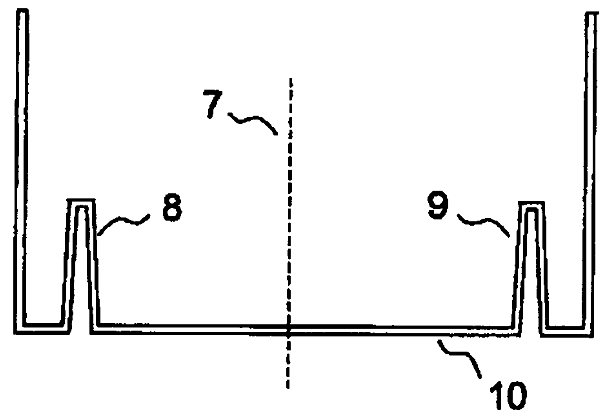


FIGURE SEVEN

# ACOUSTIC METAL PROFILE

This invention relates to the processing of strip material and its subsequent use in partitioning systems. The purpose of the invention is to significantly improve the acoustic separation between rooms or areas divided by such partitions.

Cold rolled steel profiles are commonly used in the construction industry to form the framework on which plasterboard is mounted to form partitions. These can either be load bearing or non-load bearing profiles, depending on the design of the building. The design of the profile has a profound effect on the acoustic separation achieved using such systems. The degree of acoustic separation is an important commercial factor in the success of the design and many factors affect it such as the mass of the board and amount of insulation inserted between the two layers of board. Such systems are found in both commercial and residential applications, where they are subject to legislative measures governing the minimum performance requirements. It is a trend in the industry for these requirements to place greater demands on the design of the metal profiles.

Steel partitioning systems (Figure 1) generally comprise a series of vertical steel elements 1 (studs with a cross sectional profile shown in Figure 2) and top and bottom channels 2 for these to sit in (tracks with a cross sectional profile shown in Figure 3). Typically, the studs will be fixed top and bottom to the channels using self tapping screws. Furthermore, plasterboard is attached to either side of the resulting framework using a series of screws along the length of the studs and tracks.

Acoustically, this arrangement behaves as a damped-mass-spring system. To achieve the best acoustic performance, the system preferably exhibits very low stiffness and if possible, very high damping.

The vertical studs, play a particularly important role in the transmission of sound from one side of the partition to the other. The metal profile acts as a bridge from one layer of plasterboard to the other. Acoustically, if this bridge is very stiff, then the energy transfer is highly efficient resulting in poor attenuation. If the connection exhibits low dynamic stiffness, then energy transfer is poor and transmission loss is high.

There are have been a number of designs produced which attempt to isolate one side of the stud to the other. The present invention claims to be the most efficient way of achieving low dynamic stiffness without compromising production costs or product integrity.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a view of a typical track and stud arrangement,

Figure 2 is a cross section of a typical stud section,

Figure 3 is a cross section of a typical track section,

Figure 4 is a cross section of a stud section with an acoustic spike,

Figure 5 is a cross section of a track section with an acoustic spike,

Figure 6 is a cross section of a stud section with a perforated acoustic spike,

Figure 7 is a cross section of a track section with two acoustic spikes,

This invention relates to a modification to a typical stud design which results in a dramatically reduced dynamic stiffness. It has been found that the most effective means of reducing stiffness, without introducing significant extra material (and therefore cost), is to form in the base of the profile one or more narrow spikes 3 that rise almost vertically from the base (Figure 4).

The tip of the spike, effectively acts as a pivot with a certain amount of resistance. If the total width of the spike 4 is small compared to the height 5, then any force acting across the partition will act almost perpendicularly to this pivot. As a result, a large component of this force creates a moment about this pivot. Equally, the greater the height of the spike, the greater the mechanical advantage this force has about the pivot. In combination, a narrow tall spike most effectively overcomes the resistance in the pivot and therefore achieves the lowest stiffness. (There is no reason for the tip of the spike to be especially sharp, and it may be desirable to have this slightly rounded to reduce stress and the possibility of cracking the metal.)

In practice, it is desirable for the total width of the spike 4 not to exceed about two millimetres. This allows the system to exhibit very low dynamic stiffness, whilst preventing excessive static compression. Such compression can lead to cracking of the plasterboard and/or its finish. Gaps of less than 1 mm are difficult to attain during production and therefore a typical spike will have a gap 4 of the order of one to four millimetres. Analysis shows that once the ratio of the spike height 5 to width 4 exceeds five, there are rapidly diminishing returns of transmission loss. Since it is cost effective to minimise the amount of

added steel, it is desirable to keep the height of the spike to between three and fifteen millimetres, depending on the gap 4. It should be pointed out however, that the ratio between height and width is more important than the absolute values. For example, there may be applications where the scale of the partition does not resemble commonly found systems, that would require much larger or smaller spikes.

There are many possible embodiments of the invention, some of which are described below.

It is possible to further improve the performance of the spike by forming during production, a perforated tip 6 (Figure 6). Although perforating the entire section would improve performance the most (as all elements of the base act as a spring to differing extents) the tip of the spike is the most critical area. By removing fifty percent of the material at this point, approximately sixty percent reduction in spring stiffness can be achieved with very little reduction in the overall strength of the section.

When fixing the track sections, it is typical to stagger fixings along the length either side of the central axis 7. In this case, a central spike as shown in Figure 5 would be straddled by the fixings, effectively using the floor or ceiling to bypass the spike and negate its effect. To avoid this, it is possible to place two 8,9 (perhaps perforated) spikes at the extremes of the base 10 of the section as shown in Figure 7. This ensures that all fixings will be between the two spikes and that the plasterboard will be effectively isolated from the floor or ceiling.

The same arrangement could be used for the studs but this is not as important. The nearer the spike is to the extremes of the base of the stud, the smaller it must be to avoid any potential collision with the plasterboard fixings.

# CLAIMS

1. a metal profile for partition walls comprising at least one kink between the outer flanges of the profile, whereby the height (5) of the kink is at least three millimetres from the base of the stud and the gap (4) at the base of the kink is less than half of the height of the kink
2. a metal profile 'stud' (1) according to claim 1.
3. a metal profile 'track'(2) according to claim 1.
4. a metal profile according to claim 1, wherein the base width is between 30 and 210 mm
5. a metal profile according to claim 1. wherein the flange length is between 30 and 80 mm
6. a metal profile according to any of the previous claims that comprises a plurality of such kinks
7. a metal profile according to claim 6. whereby the kinks exhibit a variety of heights
8. a metal profile according to any of the previous claims that comprises a plurality of holes or perforations along the kink or kinks.
9. a metal profile according to any of the previous claims wherein the material thickness is between 0.4 and 1.5 mm
10. an internal or external wall comprising inner and outer boards fixed to a supporting metal frame comprising profiles according to any of the previous claims.

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| **Application No:** | GB 0122963.2 | **Examiner:** | James Hull |
| **Claims searched:** | All | **Date of search:** | 27 January 2003 |

## Patents Act 1977 : Search Report under Section 17

**Documents considered to be relevant:**

| Category | Relevant to claims | Identity of document and passage or figure of particular relevance | |
|---|---|---|---|
| X | 1 to 10 | WO 97/23694 A1 | BANRO. See Figures.<br>Structural profile. |
| X | 1 to 10 | GB 1483622 A | BPA. See Figure 2.<br>Sound attenuating walls. |
| X | 1 to 10 | EP 1124023 A2 | RICHTER-SYSTEM. See Figures. |
| X | 1 to 5, 8 to 10 | EP 1074671 A2 | PROFIL-VERTRIEB. See Figures.<br>Upright construction section. |
| X | 1 to 5, 8 to 10 | EP 1127989 A2 | GEBR KNAUF. See Figures 1 and 2.<br>Profile upright for noise insulating wall. |
| X | 1 to 5, 8 to 10 | GB 1068761 A | WILLATTS. See Figures.<br>Metal posts. |

Categories:

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| X | Document indicating lack of novelty or inventive step | A | Document indicating technological background and/or state of the art. |
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### Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC$^{V}$:

E1D

Worldwide search of patent documents classified in the following areas of the IPC$^{7}$:

E04B
E04C

The following online and other databases have been used in the preparation of this search report:

WPI, EPODOC, JAPIO